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ABSTRACT

Following a brief overview of the Japanese educational system and its programs for handicapped children, the role of microcomputers in Japan's schools is described. Most secondary and some elementary schools in Japan have acquired computers to enhance the processes of learning and teaching. In schools for the handicapped, computers are also being utilized, especially in programs for hearing and visually impaired students. A shortage of special education courseware has been a problem, and provincial education centers and individual teachers are developing appropriate courseware. Hardware developments include the design of special input-output devices designed to meet handicapped students' needs. Training is necessary to help teachers understand the technology and the role changes brought about by computers. Workshops are sponsored by the National Institute of Special Education to train special educators in the use of computers. Japan has several commercial electronic networks and bulletin boards that link scattered projects, but a need is felt for a network solely intended for special educators. Appended to the paper are statistical data on the numbers of special schools and numbers of handicapped students by handicapping condition, by type of school, and by grade level. (JDD)

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State of the Art in Microcomputer Use for Japanese Special Education

by

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1. Introduction

Under the Japanese Constitution, education is identified as a National responsibility. Under this provision, each prefecture has its own Board of Education, conducts a nationally unified system of schools, and executes schooling. To compound the situation, in each prefecture there are non-government school systems. These systems are independent of the prefecture education systems, but interact with them when necessary, such as for curriculum and instruction, teacher qualification, schooling days, et al.

One of the Japanese national government ministries is that of Education, Science and Culture which bestows upon the National Council on Education a particular responsibility for school age children, aged from 6 to 15 years. A prime concern of the Ministry is to provide and disperse money for all aspects of Japanese education in the form of funds and grants.

The School Education Law provides general regulations for the operation of the system at all education levels. The structure of the official education system is summarized in figure 1. Its elementary and secondary portion is organized along the lines of the 6-3-3 model. The total structure includes the following 9 levels of institutions (Ministry of Education, Science & Culture, 1986): (Fig. 1)

1) preschools and daycare centers,
2) 6-year elementary schools,
3) 3-year lower secondary schools, corresponding to junior high school
4) 3-year upper secondary schools, corresponding to senior high school in the US
5) schools for the handicapped
6) 4-year colleges and universities, many of which have graduate schools
7) 2-year junior colleges
8) technical colleges, and
9) special training schools offering vocational training at both the upper secondary and 2-year college level.

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2. Special Education in Japan

Some characteristics of Japanese special education should be mentioned in order to grasp the entire scope of Japanese education practice. First, the basic organizational framework relies heavily on direction and control from the central authority. Second, the compulsory schooling for handicapped children was enacted in 1979. Third, Japanese special education is essentially segregation. Students obtain special education services either in separate schools or in separate classes. Mainstreaming is being advocated and highlighted gradually by parents and concerned educators; however, the issue is still in limbo. Fourth, teachers and administrators have discretionary authority in placement, assessment and evaluation of IEP and students' performance. No IEP procedures are mandatory. Fifth, free public education services are provided to the handicapped population from age six through age 15. Though postsecondary education is not mandatory, all provincial government bodies run separate schools for the upper secondary handicapped population. Sixth, only about one percent of school age children is receiving special education services. The number of handicapped students enrolled in separate schools and separate classes is 193,400 nationwide (Ministry of Education, Science & Culture, 1987). (Tables 1 &2)

3. Microcomputers in Schools

3. 1 General Statements

By 1986, most secondary and some elementary schools in Japan had acquired computers to enhance the processes of learning and teaching. Incentives had come from a variety of sources - national, prefectural, and municipal education authorities. At best, the computer was seen as a way of improving the whole educational process. More frequently, computers were purchased by 'expert' teachers, because (1) they were fun; (2) it was a generally held notion that children learned better, even though there was little evidence to prove this; and (3) there was a generally held view that it was essential for children to learn about computers, as computers were found everywhere else in society and therefore should also be in schools.

In schools for the handicapped, computers have been implemented via initiatives by national and local education authorities. One of the other sources is a US computer company which donated its computer products along with some software to all schools for hearing impaired students in 1986. Many individual schools for visually handicapped and hearing impaired students at many locations throughout Japan have incorporated computers into their classroom teaching. However, many municipalities have only just taken steps to support these computing practices by

promoting computer education to an area of high priority and by introducing the systematic development of computer education. (Fig. 2)

The choice of which microcomputer brand will be used in each school has generally been left to the prefectural and municipal schools to decide. The most popular brand of microcomputer used in Japan is the 16-bit PC-9800 , a Japanese-made micro.

Computer education has a rather long history in the training of speech and language at the schools for the hearing impaired in Japan. Auditory testing and subsequent choice of appropriate hearing aids for an individual has been gradually practiced in national and local education centers. The research and development for a variety of speech communication training aid systems using digital signal processors for the hearing impaired is decidedly on its way (Uozumi, 1988). Furthermore, teachers and students now have access to newspapers and encyclopedias on on-line databases through a voice-synthesizer and an automatic braille-translator. A prototype for creating braille sentences has been used along with the synthesized voice.

3.2 Special Education Center

The National Institute of Special Education (NISE) has been the leading institution for special education since its foundation in 1971. NISE provides information and advice about the use of microcomputers and other microelectronic devices in special education; it fosters software development, and enables schools to try hardware and software before any purchasing decisions are taken. The Department of Educational Technology at NISE has prepared two types of low-cost workshops for special educators. The first one is to provide an introduction or brush-up course on the components, capabilities, and use of computers in special education. This workshop provides an understanding of what computers can and cannot do, how the internal components work inside the computer, and how programs control its operation. The second one is directed toward individuals with intermediate and advanced skills, who have used computers and are interested in understanding the current and future limitations and potential of computers for handicapped students. This workshop covers how different access adaptations and systems work, and what role computers play in education and rehabilitation.

These workshops are intended to promote and contribute to in-service training of teachers by running courses, offering 'hands-on" experience, and stimulating discussion of good classroom practice. The workshops are aimed at teachers of children with mental retardation as well as of those with physical or sensory disabilities. In most provinces, there are education centers which take an active role in courseware development and in-service

training of teachers.

Most work in research and evaluation of computer-assisted learning has just started, formative and summative, in provincial education centers. More specifically, the efforts range from researching computer based activities of learning to studying the individual effects of large-scale exposure to computers on disabled students.

3.3 Courseware Development

There is still a chronic shortage of courseware for students in general and not least, disabled students. Until recently, the use of computers in special education for the handicapped was limited to the usage of existing courseware, considered adequate for special needs. In addition, most courseware was drill and practice oriented -- mostly in arithmetics. Presently the range of subjects is much wider, with more sophisticated applications being developed gradually.

A recent survey has disclosed that courseware is developed mostly by individual teachers and by teacher teams (Japan Association for Promotion of Educational Technology, 1986). (Tables 3 & 4) Provincial education centers are putting an emphasis on the development of courseware by themselves, or at least, by sending representatives of the centers to local teacher teams. Authoring and delivery tools exist for drill and practice, tutorials, remedial learning, simple simulations, and educational games. However, the quality of these Japanese made tools are far behind the level of American products (Narita, 1988).

A number of software programs including databases are commercially available. However, few programs command teachers' respect. Though they encompass eye-catching graphics, sounds, and a user-friendly approach, the educational content is often irrelevant to the curriculum. Teachers know the problems faced by students and understand the curricula issues, but very few of them have the time, training or skills to become good programmers. Engineers, 'expert' teachers, and computer programmers have separately written programs, but not to great effect.

The question of how much centralization of production is desirable remains unanswered. Programs are in fact being written for disabled students in perhaps a hundred localities, often without sufficient resources. It could be suggested that an electronic conference network such as SpecialNet in the US should be established by linking teachers, administrators, programmers and engineers, for the purpose of developing and disseminating new programs.

3.4 Hardware

Teachers want devices and systems that match individual students' needs. Research efforts are under way to develop a system which provides choice between single or multiple switches, whether based on gross arm movements, eyelash flick, tongue movements, or suck and blow. Some of them are already in the schools, for instance, a touch screen device, concept keyboards, a puff switch, large print and displays, spoken input and output, et al. Many involved in research and development in this field hope that a relatively small range of microelectronic hardware plus a wider range of software will be the ultimate answer to problems of meeting the individual needs of disabled students. There is a general problem of many small and almost paralleled hardware and software developments proceeding at the same time. We are now keeping a close eye on the implementation of Initial Guidelines for Electronic Equipment Accessibility adopted in September,1987 in the US (US Department of Education, 1987). Standards have not yet been established in Japan. Similar guidelines for electronic equipment accessibility have been strongly voiced.

3.5 Teacher Training

A question arises whether teachers are willing to change roles when disabled students use technology. Classroom teachers have to adapt when able-bodied students begin to use microcomputers, because the students become increasingly self-motivated and independent. Disabled students may still require help in operating the equipment, but for their teachers, the role change is even greater as the students find a degree of independence in their learning, far beyond the what they have previously experienced.

On one hand, in many special schools, there is one or several teachers who are the computer end users or computer 'expert'. These teachers very radically change role. On the other hand, the rest leave the computing to them and thus avoid changing their own roles. In general, it would be better if many more teachers gained at least some understanding of the technology, because the 'experts' become increasingly separated from the rest as they master new developments and do less and less ordinary teaching.

A community of users' among teachers is well worth establishing, with a fully range of novices and experts. This has been done successfully in many conventional schools. Not all teachers need become experts, by any means; novices learn more when they need to, within such a community, and are helped over any 'computerphobia.'

NISE and provincial education centers are heavily geared toward formal initial and in-service training in using the technology for teaching disabled students. These institutions are preparing three types of training programs for: 1) computer education coordinators, 2) computer programmers

and consultants, and 3) end-users. The syllabus of these training programs with teaching materials and methodology will be available in the very near future.

3.6 Network

In Japan there are a dozen of commercial electronic networks and bulletin boards that link scattered projects, some educational. One special interest group(SIG) composed of educators for hearing impaired students is very active in improving their programs and professional skills through a commercial electronic mail and bulletin boards system. However, in Japan there is none of network such as SpecialNet in the US which is solely intended for special education personnel. It could be suggested that an electronic conference network should be established to provide electronic mail, access to major databases of may kinds and electronic bulletin boards on computer applications, legislative activities, newly developed programs, questions and answers, et al in special education community.

4. Concluding Remarks

Considering the present extent of proliferation of microcomputers, teacher training, courseware development, and network in special schools, one may conclude that computers in special education are likely being established in Japan. However, a critical ingredient for the schools and the individual students at home is missing. The recent survey reveals about a sparse inventory of courseware in special education; there is a severe shortage in courseware repertoire that can be used by disabled students. In addition, there is a lack of man-machine interface peripherals to insure handicapped students use electronic equipment.

More massive funding is an imperative by authority -- direction and control from the central and provincial governments. It is essential for the nation to invest moneys to education. No doubt that there will be a massive expansion of education in the 1990s. Social and economic payback of such an expansion is invaluable.

What should the new technology be used for in educating disabled children and in administrating student records in Japan? Special education is susceptible to new hardware and software. There are two aspects to the question: first, the technology can be used to compensate for a disability, such as speech-impairment; second, it can be used to teacher across the curriculum, given appropriate software. Japanese disabled students and teachers seem certain to benefit from further advances in new technology, provided that it is not merely another bandwagon.

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Appendix -- Figures and Tables

Fig. 1 Organization of the Present School System

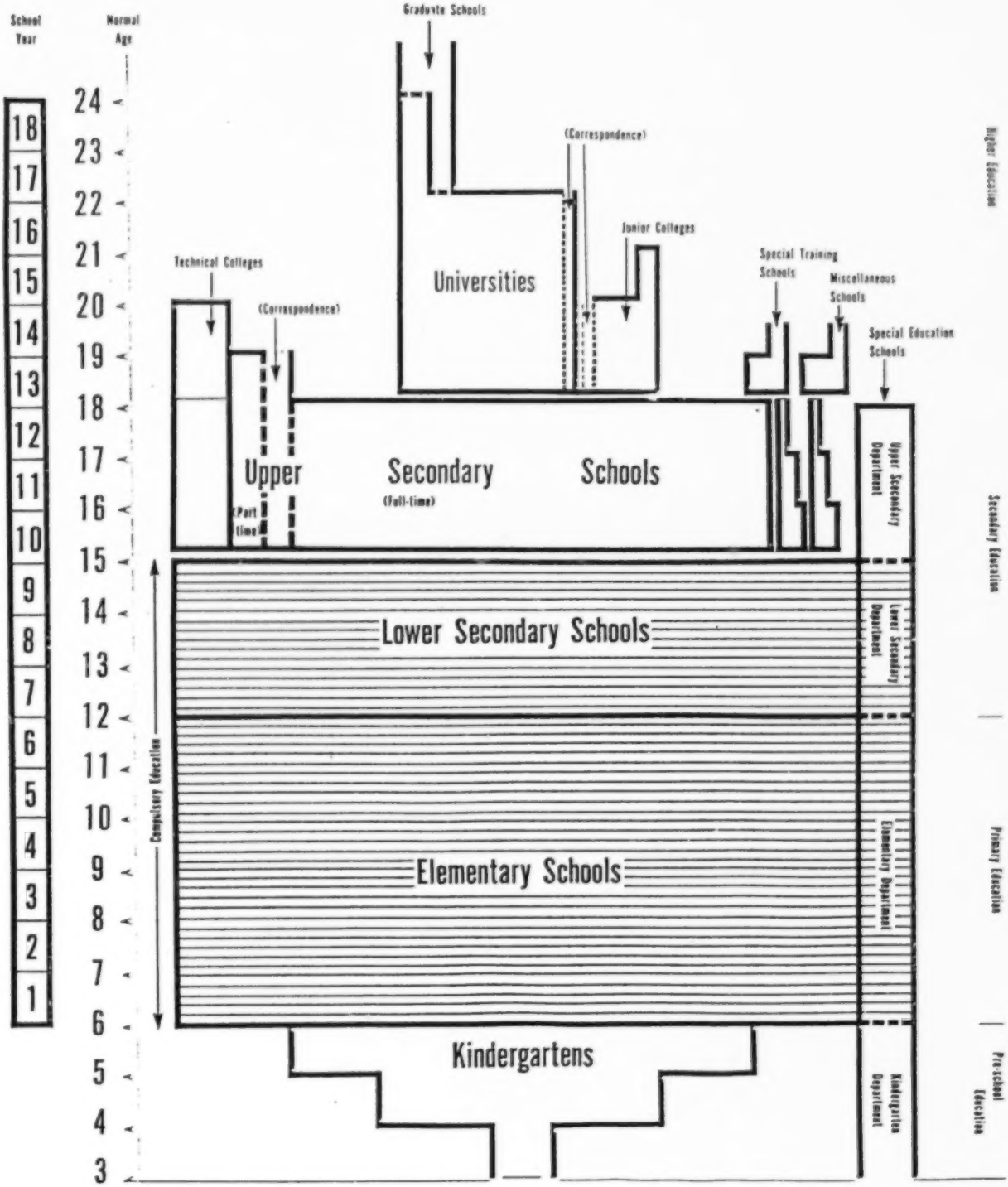

Table 1 Number of Special Schools, Classes, Students

Type of School	Establishing Body	School			Class			Student						
		Kinder-garten	Elementary	Lower Secondary	Upper Secondary	Total	Kinder-garten	Elementary	Lower Secondary	Secondary Regular Course	Secondary Advanced Course	Sub Total	Grand Total
Blind	National	1	2	12	6	22	42	6	31	39	76	86	162	238
	Local	67	62	422	302	664	1,450	159	1,106	1,134	2,071	1,713	3,784	6,183
	Private	2	3	7	4	14	28	10	13	12	65	30	95	130
	Total	70	67	441	312	700	1,520	175	1,150	1,185	2,212	1,829	4,041	6,551
Deaf	National	1	9	14	7	17	47	42	79	62	93	73	166	349
	Local	105	380	737	403	553	2,073	1,664	2,755	1,591	2,138	516	2,654	8,664
	Private	1	6	6	3	0	15	34	31	10	0	0	0	75
	Total	107	395	757	413	570	2,135	1,740	2,865	1,663	2,231	589	2,820	9,088
MR	National	42	10	140	123	123	396	22	827	806	1,317	0	1,317	2,972
	Local	406	7	4,174	3,295	1,973	9,449	17	17,859	15,774	15,677	0	15,677	49,327
	Private	12	2	21	20	35	78	5	120	120	244	59	303	548
	Total	460	19	4,335	3,438	2,131	9,923	44	18,806	16,700	17,238	59	17,297	52,847
Physically Handicapped	National	1	0	19	8	6	33	0	94	42	43	0	43	179
	Local	183	33	2,209	1,383	965	4,590	145	8,562	5,552	5,819	0	5,819	20,078
	Private	2	0	11	6	3	20	0	46	39	27	0	27	112
	Total	186	33	2,239	1,397	974	4,643	145	8,702	5,633	5,889	0	5,889	20,369
Health Impaired	National	0	0	0	0	0	0	0	0	0	0	0	0	0
	Local	95	2	930	704	143	1,779	2	3,376	2,878	746	0	746	7,002
	Private	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	95	2	930	704	143	1,779	2	3,376	2,878	746	0	746	7,002
Total	National	45	21	185	144	168	518	70	1,031	949	1,529	159	1,688	3,738
	Local	856	484	8,472	6,087	4,298	19,341	1,987	33,658	26,929	26,451	2,229	28,680	91,254
	Private	17	11	45	33	52	141	49	210	181	336	89	425	865
	Total	918	516	8,702	6,264	4,518	20,000	2,106	34,899	28,059	28,316	2,477	30,793	95,857

As of May 1, 1986

Table 3 Software Development (As of March 1, '85)

School	Individual	Teacher Made	Edcation Center	Com-mercial	Rented	UK
Blind	26.7	16.7	0	20	13.6	13.3
Deaf	31.7	9.5	0	38.1	23.3	19.1
MR et al.	39.2	5.8	2.5	28.3	19.1	15.9
Total	35.2	8.5	1.4	30	8.3	11.3

Fig 2 Microcomputers in Special Schools

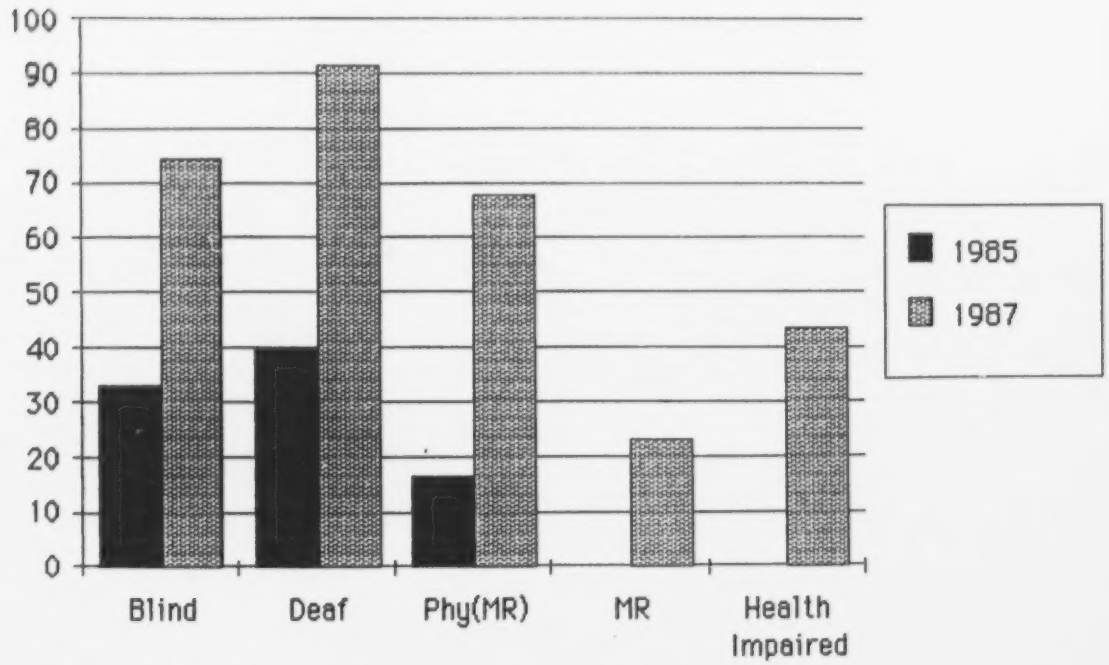

Table 2 Number of Special Classes and Students in Regular Schools

Type of Handicap	Elementary School		Lower Secondary School		Total	
	Class	Student	Class	Student	Class	Student
Partially Sighted	65	196	24	70	89	266
Hard of Hearing	386	1,349	124	472	510	1,821
Speech Handicapped	1,321	6,707	88	244	1,409	6,951
MR	10,192	44,228	5,597	28,184	15,789	72,412
Physically Handicapped	217	798	113	340	330	1,138
Health Impaired	508	2,553	106	344	614	2,897
Emotionally Disturbed	2,156	8,434	868	3,629	3,024	12,063
Total	14,845	64,265	6,920	33,283	21,765	97,548

As of May 1, 1986